AEROLOGICAL OBSERVATIONS FOR THE YEAR 1936

[Aerological Division, D. M. LITTLE in charge]

By L. P. HARRISON

Table 1 presents the mean free-air temperatures and relative humidities obtained by airplanes during the year 1936. Departures from normal are given for five stations where the length of record is 4 or more years (see footnote to table).

The data are too meagre to warrant much discussion. In comparing the values for the various stations, it is necessary to keep in mind that only 99 airplane observations were made at Seattle, Wash., during the year, so that the means for that place have much less weight than the means for the remaining stations. It is of interest to construct isothermal and isohygrometric charts for the standard levels. The apparent anomalous coldness of the free air over San Antonio (Kelly Field), Tex., with respect to surrounding places is noteworthy. Similarly, attention should be directed to the relative dryness of the free air over Montgomery (Maxwell Field), Ala.

A general statement regarding the aerological activities of the Weather Bureau during 1936 follows: At the end of the year the Weather Bureau had 12 regular airplane weather observation stations in continental United States where flights were made by private operators under contract. Flights were made by the War Department at eight stations in cooperation with the Weather Bureau, while flights were made by the Navy Department at nine stations. During August and September 1936 the Weather Bureau established new airplane stations at Miami, Fla., Oakland, Calif., Salt Lake City, Utah, and Sault Ste. Marie, Mich. On September 15, 1936, the Weather Bureau established a special airplane weather observation station at Fairbanks, Alaska, to operate until March 15, 1937, with funds provided in a special grant authorized under the Bankhead-Jones Act, for the investigation of the structure of Polar Continental air and the development of cold waves in North America. The Navy Department began making regular airplane observations at Coco Solo, Canal Zone, and St. Thomas Island, Virgin Islands, during the latter part of the year.

The total number of pilot balloon stations maintained by the Weather Bureau during the year was 77, where 247 observations were made daily over the country as a whole.

During the International Month of November, the Weather Bureau released 37 sounding balloons at Omaha, Nebr. Thus far 28 of the meteorographs so released (76 percent) have been returned.

During the last half of that month at the same place, 11 radiometeorographs with sounding balloon meteorographs attached were also released. Thus far nine of these have been found. The radiometeorographs were of the type designed by L. F. Curtiss and A. V. Astin, of the National Bureau of Standards, in cooperation with the Weather Bureau.

In addition, six sounding balloons with meteorographs and attached devices for capturing air samples at great heights were released for F. A. Paneth, of the Imperial College of Science and Technology, London. Five of these have already been returned.

The Aeronautical Engineering Department of the Institute of Technology at the University of Minnesota under the direction of John D. Akerman released a small number of sounding-balloon meteorographs for the Weather Bureau near Minneapolis, Minn., during the latter part of November and early December.

A number of experimental radiometeorograph soundings were made at Washington, D. C., during the course of the year by L. F. Curtiss, of the National Bureau of Standards, in cooperation with the Weather Bureau. Progress is still being made in the development of a radiometeorograph which can be successfully used for daily ascents.

TABLE 1.—*Mean free-air temperatures and relative humidities obtained by airplanes during year 1936*

TEMPERATURE (°C.)

Stations	Altitude (meters) m. s. l.																		Number of observations
	Surface		500		1,000		1,500		2,000		2,500		3,000		4,000		5,000		
	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	
Barksdale Field (Shreveport), La.[1] (52 m)	14.6		16.8		15.0		12.9		10.6		8.2		5.7		0.1		−6.6		336
Billings, Mont.[2] (1089 m)	5.2						7.5		5.5		2.5		−0.8		−7.4		−14.3		360
Boston, Mass.[1] (5 m)																			
Cheyenne, Wyo.[2] (1873 m)	3.8								5.2		5.0		2.1		−4.9		−12.4		361
El Paso, Tex.[2] (1194 m)	13.7						15.4		13.4		10.2		6.9		0.0		−6.8		366
Fargo, N. Dak.[2] (274 m)	0.6		3.1		2.7		1.7		0.0		−2.3		−5.0		−10.7		−17.1		349
Kelly Field (San Antonio), Tex.[1] (206 m)	14.6		12.3		11.5		9.8		7.9		5.6		2.8		−3.5		−10.4		325
Lakehurst, N. J.[3] (39 m)	8.3		8.7		7.1		5.5		3.6		1.6		−0.6		−6.1		−11.9		280
Maxwell Field (Montgomery), Ala.[1] (52 m)	15.5		16.7		14.8		12.3		10.1		7.8		5.3		−0.5		−6.5		308
Mitchel Field (Hempstead, L. I.), N. Y.[1] (29 m)	7.9		8.5		7.1		5.4		3.4		1.4		−0.9		−6.1		−12.2		277
Murfreesboro, Tenn.[2] (174 m)	11.3		13.3		12.1		10.1		7.8		5.4		2.9		−2.7		−8.7		357
Norfolk, Va.[3] (10 m)	12.7	−1.1	13.2	−0.1	10.9	−0.4	8.7	−0.4	6.5	−0.3	4.1	−0.4	1.6	−0.5	−4.1	−0.9	−10.0	−1.0	228
Oklahoma City, Okla.[2] (391 m)	12.5		13.9		14.2		12.6		10.3		7.5		4.4		−2.0		−8.4		349
Omaha, Nebr.[2] (300 m)	6.8	−0.6	8.4	−0.2	9.2	−0.4	8.2	−0.3	6.2	−0.3	3.5	−0.4	0.6	−0.4	−5.8	−0.4	−12.8	−0.7	362
Pearl Harbor, Territory of Hawaii[3] (6 m)																			
Pensacola, Fla.[3] (13 m)	16.8	−0.8	17.4	+0.3	15.4	+0.3	13.1	+0.2	10.8	+0.2	8.4	+0.2	6.0	+0.3	0.4	+0.3	−5.6	+0.3	345

[1] Army. [2] Weather Bureau. [3] Navy.

TABLE 1.—*Mean free-air temperatures and relative humidities obtained by airplanes during year 1936*—Continued

TEMPERATURE (°C.)

Stations	Altitude (meters) m. s. l.																Number of observations
	Surface		500		1,000		1,500		2,000		2,500		3,000		4,000		5,000		
	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	
San Diego, Calif.[3] (10 m)	14.8	−1.3	15.2	+0.1	16.1	+0.5	14.9	+0.6	12.3	−0.1	9.6	−0.2	6.6	−0.4	0.6	−0.2	−6.0	−0.2	357
Scott Field (Belleville), Ill.[1] (135 m)	7.9		11.1		10.9		9.2		6.8		4.2		1.6		−4.4		−10.7		291
Seattle, Wash.[3] (10 m)	9.7	−1.3	7.6	−1.5	6.0	−1.2	3.7	−1.2	1.4	−1.0	−1.1	−1.0	−3.5	−0.9	−9.6	−1.4	−16.8	−2.2	99
Selfridge Field (Mount Clemens), Mich.[1] (177 m)																			
Spokane, Wash.[2] (596 m)	5.4				8.6		7.9		5.5		2.5		−0.6		−7.0		−13.7		362
Sunnyvale, Calif.[3] (10 m)																			
Washington, D. C.[3] (13 m)	9.6	−1.9	10.5	−0.3	8.6	−0.4	6.6	−0.4	4.6	−0.4	2.4	−0.4	0.0	−0.6	−5.2	−0.7	−10.6	−0.5	
Wright Field (Dayton), Ohio[1] (244 m)	7.4		9.2		8.5		6.9		4.8		2.4		−0.2		−5.7		−12.0		307

RELATIVE HUMIDITY (PERCENT)

Barksdale Field (Shreveport), La.	80		63		59		56		52		47		45		43		39		
Billings, Mont.	58						50		49		52		55		57		56		
Boston, Mass.																			
Cheyenne, Wyo.	66								61		53		52		53		54		
El Paso, Tex.	51						47		47		48		48		49		46		
Fargo, N. Dak.	75		65		60		56		53		51		51		50		50		
Kelly Field (San Antonio), Tex.	87		76		68		62		56		51		47		44		42		
Lakehurst, N. J.	79		66		62		59		57		54		50		46		42		
Maxwell Field (Montgomery), Ala.	78		62		58		57		50		46		42		38		34		
Mitchel Field (Hempstead, L. I.), N. Y.	82		73		69		67		63		58		54		51		49		
Murfreesboro, Tenn.	82		69		65		62		59		54		51		46		42		
Norfolk, Va.	80	+5	65	−1	61	−1	59	0	56	0	52	−1	49	0	47	+3	45	+5	
Oklahoma City, Okla.	69		65		56		53		50		48		47		46		43		
Omaha, Nebr.	74	−5	66	−6	58	−2	54	−1	52	0	52	+1	51	0	50	+1	50	+3	
Pearl Harbor, Territory of Hawaii																			
Pensacola, Fla.	86	+4	74	0	69	0	64	0	58	−1	53	−2	49	−2	43	−2	38	−3	
San Diego, Calif.	84	+9	76	+5	56	+3	44	+1	40	+4	37	+4	36	+5	35	+6	34	+7	
Scott Field (Belleville), Ill.	79		61		54		52		52		50		48		45		43		
Seattle, Wash.	79	+2	76	+2	71	+1	69	+3	65	+3	61	+4	57	+5	54	+6	52	+5	
Selfridge Field (Mount Clemens), Mich.																			
Spokane, Wash.	76				64		58		58		58		58		56		53		
Sunnyvale, Calif.																			
Washington, D. C.	79	+6	58	−6	57	−4	56	−3	55	−2	51	−3	48	−2	44	−2	41	−1	
Wright Field (Dayton), Ohio	81		71		65		60		58		56		53		50		49		

Observations taken about 4:00 a. m., 75th Meridian time except along the Pacific coast and Hawaii where they are taken at dawn.

[1] Army. [2] Weather Bureau. [3] Navy.

NOTE.—The departures are based on normals covering the following total number of observations made during the same month in previous years, including the current month: The departures are based on normals covering the following total number of observations made during previous years, including the current year. The figures in parentheses indicate the number of years of record. (When the number of years of record varies for the different months of the year, the various numbers pertinent thereto are all given): Norfolk, 1701 (6, 7, 8); Omaha, 1907 (5, 6); Pensacola, 2212 (8, 9); San Diego, 2201 (8); Seattle, 693 (4, 6, 7).

RIVERS AND FLOODS

[River and Flood Division, W. J. MOXOM, temporarily in charge]

By BENNETT SWENSON

There was abundant precipitation during the month of December. The amounts were near normal to considerably above normal, rather generally, east of the Great Plains and also over a large area of the far Southwest; falls were scanty over most of the Northwest and the Rio Grande Valley.

Over the Atlantic slope drainage, where the precipitation was generally quite heavy, the rivers from southern Virginia to Florida were near or above flood stage at some time or other during the month. The most severe flooding occurred in the Neuse and Cape Fear Rivers in North Carolina and in the Santee and Savannah Rivers in South Carolina and Georgia. These rivers were in flood a good part of the month, however, no appreciable amount of damage was incurred.

Some flooding occurred in the Sulphur River in Texas during the first half of the month and again at the close.

The lower Ohio River and tributaries began to rise during the closing days of the month from the gradual accumulation of precipitation. The Wabash River system reached flood stage in the West Fork of the White on the 31st and in the Wabash proper on January 1st and 2d. The Tennessee and Cumberland Rivers showed rises with the Tennessee going just slightly above flood stage at Decatur, Ala., on the 27th.

At St. Louis, Mo., on the Mississippi River, a low stage of 3.2 feet below zero was recorded on the 17th which is the lowest free-water stage of record for the month of December at that station.